Sport Education and Society

Vol. X, No. X, Month 200X, pp. 000–000

ARTICLE: 7,851 words

Primary Physical Education: A Complex Learning Journey for Children and Teachers

Mike Jess[1*], Jeanne Keay[2] & Nicola Carse[3] [where * denotes corresponding author, see below]

[1] University of Edinburgh
Holyrood Road,
Edinburgh, EH8 8AQ
44(0) 131-651-6646
mike.jess@ed.ac.uk

[2] University of the West of Scotland
High St
Paisley, PA1 2BE
44(0) 141 848 3553

jeanne.keay@uws.ac.uk

[3] University of Strathclyde
St James Road
Glasgow G4 0LT
44(0)141 444 8029
nicola.carse@strath.ac.uk

.

[*] Corresponding author. Institute of Sport, Physical education & Health Sciences,, The Moray House School of Education, The University of Edinburgh, St. Leonard's Land, Holyrood Road, Edinburgh, EH8 8AQ, Scotland, UK
Email: mike.jess@ed.ac.uk, 44(0) 131-651-6646 (phone)

Abstract

Primary physical education (PPE) is increasingly being recognised for the role it can potentially play in setting a foundation for lifelong engagement in physical activity. However, the majority of the literature continues to focus on the negative features of the subject within the primary context. Whilst acknowledging the existence of these barriers, this paper sets out to take a proactive approach by presenting a conceptual framework for PPE that seeks to support a renewed and positive vision for the future. Based on ideas from complexity thinking, the framework represents a move beyond the more positivist and linear approaches that have long been reported to dominate practices in PPE and recognises learners as active agents engaged in a learning process that is collaborative, non-linear and uncertain. While acknowledging the contested nature of the complexity field, the paper explores how key principles, including self-organisation, emergence, similarity, diversity, connectedness, nestedness, ambiguous bounding, recursive elaboration and edge of chaos, offer a lens that views PPE as a complex system. With the children's learning positioned as the focus of PPE in the educational setting, the paper discusses how complexity principles interweave with the ecological components to help us better understand and more creatively engage with the complex nature of PPE developments. Specifically, these components are identified as PPE learning experiences and their associated pedagogy, teachers and their PPE professional learning and key environmental factors that include the physical environment and key stakeholders who influence developments across the different levels of the education system. The paper concludes by suggesting that this complexity-informed PPE framework represents an open invitation for the all those involved in PPE to engage in a collective process of exploration and negotiation to positively influence developments in PPE.

Keywords: Complexity Thinking, Ecological Perspectives, Primary Physical Education, Curriculum, Pedagogy, Professional Learning.

Introduction

While concerns have long been voiced about the state of primary physical education (PPE) (e.g. Warburton, 1989; Carney & Guthrie, 1999; HMIe, 2001; Pickup & Price, 2007), there is evidence in the UK, and globally, that these early learning experiences are beginning to receive increased political, professional and academic attention (e.g. Scottish Executive, 2004; Kirk, 2004; Hunter, 2006; Locke & Graber, 2008; Quay & Peters, 2008; Tsangaridou, 2012). Much of this interest stems from the growing perception that PPE has the potential to address fears about children's health and wellbeing, sport participation and physical activity levels (Petrie & lisahunter, 2011). While this support is to be welcomed, many concerns remain, particularly in relation to the quality of children's learning experiences in PPE (Harris, Cale & Musson, 2011). Accordingly within this paper we intend to take a proactive approach to address concerns about the quality of PPE. Building on the national PPE project work we have directly been involved with over the last decade across the UK (e.g. Jess & Collins, 2003; Keay, 2011; Campbell & Jess, 2012; Atencio, Jess & Dewar, 2012; Jess & McEvilly, 2013) we present a conceptual framework that sets out to create a revitalised vision for a more positive future for PPE.

The Complexity of Primary Physical Education

Before presenting an overview of the PPE framework, we consider how concepts from complexity thinking have been used to shape this framework. We take this approach primarily because we have found it difficult to explain PPE developments in the more linear, positivist terms that have long dominated the subject area (Kirk, 2010) and, subsequently, we have increasingly reoriented our attention to explore the ways in which complexity-oriented ideas may help us make better sense of our PPE work (Jess, Atencio & Thorburn, 2011). Throughout this period, however, we have been aware that understanding, sharing, researching and applying complexity ideas is a long term project that requires regular revisiting and reworking of key issues. The need for this recursive process largely stems from complexity thinking being a relatively new field of study that has emerged across a range of natural and social sciences in which questions are being asked about long-held positivist and mechanistic worldviews (Gare, 2000). Because of this nascent and transdisciplinary disposition, complexity thinking currently lacks clarity and employs a wide range of terminology to explain many of its ideas. Therefore, while it may have created much hype, complexity has yet to make its anticipated impact on practice (Cillers, 2009),

with the result that some authors suggest it may be a short term fad (e.g. Tinning & Rossi, 2013). However, while these challenges persist, most complexity-oriented perspectives are informed by a number of key tenets which, we suggest, offer a useful basis from which to explore the impact of conceptual and empirical possibilities of complexity thinking on practice. From an educational perspective, we are therefore in agreement with Ovens, Hopper & Butler (2013) when they highlight that the issue is not about the complexity of educational phenomena but the appropriateness of the frameworks we develop and use to make sense of the 'messiness' inherent in many educational contexts. It is therefore not our intention to present a new theoretical approach but to use complexity thinking as a lens to help us question and better understand PPE in order to develop a framework to more creatively engage with the complex nature of future PPE developments. Accordingly, this next section summarises the key complexity features that act inform the PPE framework.

Understanding Complexity Thinking

In this section we seek to present our understanding of complexity in three ways: by defining complexity, by considering how aspects from ecological thinking set a frame to support PPE developments and also by discussing how key complexity principles help make sense of PPE these developments as they unfold. First, we believe complexity is best explained by considering how different types of systems work i.e. entities made up of many interacting parts like the earth, societies, people, trains, etc. In agreement with Osberg, Doll & Trueit (2009), we support the notion that 'the distinction between what is complicated ...and what is complex...is paramount' (p. vi.) to our understanding of complexity. Complicated systems are pre-programmed structures made up of different parts that interact in a linear and closed-loop manner, are governed by cause and effect laws focussed on certain outcomes, remain stable entities and have limited, if any, interaction with the environment in which they operate. These complicated systems are common in everyday life with examples including televisions, computers and traffic lights that are all programmed to react in the same way each time. Complex systems, conversely, consist of parts that self-organise and interact with each other within their own structure and also with the external environment in which they operate (Prigogine, 1976). While this self-organising process supports the structure, order and predictability of the system, the flexibility of these 'rich interactions' (Cilliers, 1998) also enable the system to create unpredictable outcomes that help it to adapt and develop as it interacts with the ever-changing environmental demands (Morrison, 2003). Consequently, complex systems are "inherently dynamic and transformational" (Byrne, 1998,

p. 51) as they have the potential to be unstable, open-ended and non-linear while also possessing structure and order. As such, the focus of complexity is not on the system itself but the 'process of interaction between the elements' (Ovens et al, 2013). As we discuss later, this view of complexity is central to our paper as we consider PPE to be a complex system made up of many self-organising parts that interact with many other elements in a myriad of different ways.

Ecological Thinking: Framing PPE

From this definition of complex systems, we use ideas from ecological thinking to identify and structure the key elements of the PPE framework e.g. health, (Stokols, 1992), physical activity (Welk, 1999), psychology (Gibson, 1979), movement (Davids et al, 2014) physical education (Rovengo, 2006), family studies (Bronfenbrenner, 1986) and social settings (Rogoff & Lave, 1984). Consistent with complexity, ecological thinking takes a relational view of behaviour by highlighting how the environment and the individual cannot be defined without each other. For example, from psychology, Gibson (1979) describes this mutual relationship through the concept of 'affordances': 'the possible use, meaning or function of something in the environment in relation to the individual's capabilities, goals and intentions.' (1979, p. 263). The environment is thus considered in terms of what it functionally offers the individuals engaged in a task. The task is also critical to the ecological process as it sets parameters or boundaries for the individual's goals in a given environment (Newell, 1986). Critically, behaviour therefore is the outcome of the relationship between the individual, the task and the environment in which the task is attempted. However, while Gibson's thinking focused on the immediate environment, many of the authors noted above extend ecology to include the multiple layers across the broader environmental context and propose that a 'ripple' effect sees each layer influencing the other.

Drawing on this more general ecological thinking, we propose that the starting point for the PPE framework is the identification of key ecological components and the ever-changing relationships between them i.e. key task, individual and environment factors that impact on PPE development (see Figure 1). While we stress children's learning as the understandable focus of PPE as part of the education system, we also recognise that the other ecological factors are inextricably connected in an ongoing relational learning process (Armour, 2012; Rovengo, 2006). However, for the relationship between the ecological components to generate positive learning experiences for children over time, each component

has a key role to play in the development process. We therefore propose that key principles from complexity thinking will help develop a better understanding of both the key ecological components and the generative relationship between them.

INSERT FIGURE 1 ABOUT HERE

Using Complexity Principles to Understand Children as Complex Learning Systems

Having introduced these central components, we now explore how complexity principles offer a useful lens through which to view the integrated nature of PPE. More specifically, we discuss the nature and functioning of children and school classes as complex learning systems (Wallian & Chang, 2012) and suggest this will help us better understand and support the learning process children encounter in PPE. To do this, we consider a number of the key principles influencing the functioning of complex systems (Davis & Sumara, 2006) i.e. self-organisation, emergence, similarities, diversities, connectedness, nestedness, ambiguous bounding, edge of chaos and recursive elaboration. Following this, we consider the role of the other key ecological factors as part of the PPE framework.

Self-Organisation and Emergence

As suggested earlier, during the learning process children self-organise continuously through conscious and subconscious interactions that occur internally within the child and externally with the environment, task and teacher. Over time, through these multiple interactions different behaviours and learning emerge. When interactions are repeated often, these behaviours can become quite predictable e.g. waiting in turns, whereas when interactions occur less often this can lead to unpredictable behaviours e.g. this often happens in PPE when children engage with movement tasks once or on an irregular basis. Concurrent with Davis & Sumara (2010), we therefore agree it is important to acknowledge that predictability and unpredictability co-exist within complex systems.

Similarity and Diversity

For complex systems to operate intelligently a balance between similarity and diversity is required to enable the system to both support itself and also work in an adaptive and creative manner (Davis, Sumara & Luce-Kapler, 2008). If we apply this thinking to view children in PPE learning spaces, as interacting complex systems, it is possible to identify that more predictable holistic psychomotor, cognitive, social and emotional behaviours regularly

emerge. For example, as the children work together over time shared behaviours in relation to rules, tactics and etiquette often bring ordered behaviour to games situations. Concurrently, however, differences between children's holistic abilities, interests and previous experiences all lead to unpredictable, adaptable, creative and at times potentially problematic behaviours. For example, in similar games situations different children may have different understandings of the rules, may not have the movement skills to enact the tactics or may not be interested or motivated to take part. Therefore, to function effectively, children need to develop behaviours that bring order and consistency, whilst at the same time enabling them to be adaptable and creative in their response to ever-changing environmental, and task demands. Critically, there is a need to balance the degree of similarity that leads to sameness and limited adaptability, and too much diversity that can "lead to chaotic actions and disconnect" (Hopper & Sandford, 2010 p. 134).

Connectedness & Nestedness

Given the relational nature of complex systems, connections are a key feature of the learning process because "new properties and behaviours emerge not only from the elements that constitute a system, but from the myriad connections among them" (Mason, 2008, p. 48). From a complexity perspective, most connections are short range and take place in the immediate environment (Davis & Sumara, 2006) e.g. in PPE these connections will be with equipment, classmates and the teacher. For individuals and classes these different connections impact holistically on children's movement performance, cognitive understanding and social and emotional responses and in ways that are more and less predictable. Over time, these connections constantly change and, as a result, often lead to emergent behaviours that are messy and non–linear in nature.

In addition to these local relationships, children are also part of larger nested systems that are "simultaneously a unity, a collection of unities and a component of a greater unity" (Davis & Sumara, 2001, p. 85). Interconnections within and between the different levels of the nested systems are key features of complex systems, because they create a 'ripple effect' as smaller systems feed into the larger system which in turn exerts influence back into the children as individual complex systems (Morrison, 2003). For example, across the education system, children are part of a nested system incorporating the teacher, class, school, local

community, regional, national and global contexts. While the global and national layers may not directly impact on the child, national policies will likely have indirect influence at the local level. Accordingly, opportunities need to be provided throughout the children's PPE experiences to develop connections within, across and beyond their immediate context which will support the sharing of ideas so that new knowledge can be shared and created (Davis, Sumara & Luce-Kapler, 2008).

Ambiguous Bounding & Edge of Chaos

As has been already highlighted, children's self-organising efforts are iterative as they interact within contexts with ever-changing boundaries[1] created by the different ecological components – the individuals (child and teacher), task and environment. For example, an individual's skilfulness or motivation may create boundaries influencing her/his efforts, as may the teacher's pedagogical approach and, within the environment, resources and space also set boundaries. Furthermore, learning tasks contain boundaries. Some tasks have narrow boundaries that offer few possible responses e.g. a specific action used in a static target activity like archery, while other tasks have wide boundaries and offer many potential responses, e.g. an open-ended task in a dance or games context. Critically, however, within these ever-changing narrow and wide boundaries children do not react in the same predictable way but in their own self-organising manner: hence the concept of ambiguous boundaries. For example, ball size and basket height will be perceived as different task boundaries when children of different size, strength, motivation and experience attempt to throw the ball into the basketball hoop. However, these myriad interactions are not static but dynamic, because simultaneously the child is being changed by the ecological components and, in turn, changing the ecological components.

Interacting with these ever-changing and ambiguous boundaries, children's emergent behaviours result in errors, consolidation and challenge. Responses far beyond the boundaries will result in errors, e.g. children using adult equipment, taking a very wide swing, not watching the ball and failing to make contact with the ball in a tennis swing, while focussing well inside the boundaries is likely to be more successful and consolidate behaviour e.g. using a smaller racket and a larger ball, taking a very short swing and watching the ball very closely throughout. However, while this 'playing safe' approach is

[1] The concept of boundaries is also termed constraints in much of the literature (e.g. Newell, 1986; Chow et al, 2013). To avoid confusion and repetition, we will use the term boundaries throughout this paper.

important in consolidating behaviour, only using this one predictable response over time leads to stagnation and limited adaptability. Children will also explore around the boundaries by challenging themselves e.g. using different sizes of equipment, gradually widening and narrowing the racket swing and watching the ball. Working around, or close to, the boundaries is termed the 'edge of chaos' (Morrison, 2003) and results in children being "constantly poised between order and disorder (and) exhibiting the most prolific, complex and continuous change" (Brown & Eisenhard, 1997, p. 29). The more a child moves around the 'edge of chaos', the more likely it is they will be "creative, open-ended, imaginative, diverse and demonstrate rich behaviours, ideas and practices" (Morrison, 2003, p. 286). However, making errors, consolidating and exploring challenges are all key features of the learning process.

As such, children, as complex learning systems, function within boundaries that regularly shift and are "continuously transformed through the interaction of the elements" (Olsen, 2008, p. 107), and are "neither entirely fixed nor chaotic" (Davis & Sumara, 2006, p. 149). In creating boundaries consideration needs to be given as to how to foster "a delicate balance between sufficient coherence to orient actions and sufficient randomness to allow for flexible and varied response" (Davis & Sumara, 2006, p.148).

Recursive Elaboration

Finally, from a learning perspective, complex systems move through a process of recursive elaboration in which tasks are revisited and practised in different ways. This revisiting is important because learning is not only about specific knowledge, but also about organising knowledge into a conceptual framework, applying it and transferring it across different contexts (Bransford, Brown, & Cocking, 2000). This is termed deep learning (Marton, Housnell & Entwhistle, 2005) and requires children to engage in deliberate, recursive practice in relation to learning goals (Keeton, Sheckley, & Griggs, 2002). Consequently, the learning process "unfolds recursively by constantly invoking and elaborating established associations" (Davis & Sumara, 2010, p 201).

While traditional views of practise have focussed on the repetition of tasks, this more linear approach has been shown to be overly simplistic and does not help children to develop the requisite adaptability and creativity (e.g. Pinder, Renshaw & Davids, 2009). Consequently, there is a growing body of evidence, particularly within the movement

sciences, that supports the variability of practice (Chow et al, 2013) focused on helping learners 'find functional relationships between their actions and the performance environment' (p. 129) and develop their ability to 'dynamically adapt' rather than simply reproduce prescribed movement solutions. As such, this recursive elaboration process will help children develop deep learning by iteratively interacting with the different boundaries set by the different ecological components i.e. task, individual or environment. This has significant implications for teachers' PPE pedagogy in terms of their manipulation of task and environment boundaries to enable children's adaptable and creative responses. We suggest, therefore, that the principles of recursive elaboration and variability of practice raise important questions about the nature of the traditional multi-activity PPE curriculum with its short term sampling approach which often makes teachers reluctant to offer children opportunities to revisit, practice and consolidate learning in various contexts and often leads to the predominance of direct, command style pedagogical approaches.

In this first half of the paper, we have focussed on presenting key complexity thinking ideas to set the PPE framework. We have also defined what we mean by complexity thinking, presented key ecological elements that frame future developments in PPE and also, focussing on children as complex systems, considered how these ecological elements interweave with key complexity principles to help us better understand how to create a more positive future for PPE. However, given this introduction, it is important to acknowledge that the framework is not about creating a precise understanding of PPE that offers certain answers for a way forward. Rather, it is to help us better understand the complexities of PPE and to find more creative ways to engage with this complexity and develop new ways to move PPE forward. Therefore, having provided a brief overview of the ecological components and complexity principles, we now combine them to present a framework for PPE underpinned by complex ecological thinking. We propose that viewing the on-going relationships between the ecological components from a complexity perspective offers an opportunity to make PPE more effective in the long term.

The Complex Primary Physical Education Framework

Building on the complexity ideas from the previous section, we now present an overview of the framework we suggest has the potential to support future developments in PPE. Key to the framework is the recognition that PPE is a complex phenomenon and, while its general focus may be children's learning, the development of the subject area involves an iterative and interactive process between many elements. We therefore base the framework on the ecological elements discussed earlier by identifying the tasks as PPE learning activities and their associated pedagogy, the individuals as the children and the teachers directly involved in the PPE learning activities and the environment the different physical contexts in which PPE developments take place and the stakeholders at the various levels of the education system (see Figure 2). We believe this framework has important implications for the future because it offers an opportunity for PPE projects to use a new lens to creatively explore the complexities and possibilities of the subject area as it develops over time. In this introductory paper, we will only briefly introduce and explore each of these framework elements[2]: it is our intention to consider each element in more depth in future papers and projects.

INSERT FIGURE 2 ABOUT HERE

Tasks: PPE Learning Activities and Associated Pedagogy

In terms of the learning activities and pedagogy that make up children's PPE experience, complexity thinking signals a move beyond physical education's traditional positioning within the modernist paradigm with its focus on specific learning outcomes and linear pedagogy. However, with its focus on the co-existence of predictability and unpredictability, complexity thinking does not suggest a complete rejection of traditional learning methods but a move towards a more participative, collaborative, connected and process-oriented approach (Jess, Atencio & Thorburn, 2011). In particular, by focusing on the iterative relationship between the elements within the PPE framework, complexity recognises the non-linear and messy nature of the learning process as each element influences the other in a mutually interactive manner. As such, while we write about curriculum and

[2] As children have already been introduced and discussed in the introduction to the paper they will not be discussed in this brief overview.

pedagogy separately, we recognise, as do others (e.g. Penney et al, 2008; O'Sullivan, 2013), that curriculum and pedagogy are interconnected phenomena.

We suggest that learning activities in PPE should be created with a number of aims in mind. First, they should help children develop the knowledge and skills to support predictability, order and structure whilst, at the same time, enabling the emergence of uncertain, diverse and unpredictable behaviours. Second, learning experiences should be created recognising the developmental factors that impact upon children's ability to engage with the activities offered, and, as noted in many developmental texts, acknowledge that children's developmental progress is an age-related and not age-determined phenomenon (Haywood & Getchell, 2009). In addition, we suggest that PPE learning experiences should support connections (Griggs & Ward, 2012), so that physical education is viewed as an integrated, and integrating, subject area promoting links within the subject itself, across and beyond the primary school curriculum to children's lifelong and lifewide engagement with physical activity (Penney & Jess, 2004). Crucially, this developmental focus on similarity, diversity and connectivity supports the self-organising, non-linear and recursive nature of the learning process and promotes the deep learning that can be applied and transferred across different contexts.

In this vein, we are attracted by Penney's notion of PE as a 'connective specialism' that links to educational and lifelong learning agendas (Penney, 2008) and have experimented with numerous iterations of PPE learning experiences focussed on two interrelated elements: core learning activities and PPE learning applications (Jess & Collins, 2003; Jess, Atencio & Thorburn, 2011). Core learning activities focus on the more generic and holistic learning that supports children's engagement with PPE learning applications, which include the range of different games, gymnastics, dance, athletics, aquatic, sporting, outdoor and health-related activities that children meet as they move through the primary years. As such, core learning experiences refer to the interacting physical, cognitive, social and emotional learning that helps children develop the efficiency, adaptability and creativity to effectively engage with more complex physical activity contexts. It is important to highlight, however, that core learning is not presented as a set of 'building blocks' learned in a traditional manner, but embodies the learning experiences that scaffold the messiness of children's holistic learning at different rates and in different contexts. We suggest, therefore, that core learning is indeed a complex phenomenon and represents an important step forward for PPE because it not only acknowledges the complexity of the learning process but also extends beyond the

traditional and simplistic notion of 'fundamentals'. Consequently, in our efforts to develop PPE learning experiences informed by complexity principles, we have been regularly involved in projects across the pre-school and primary years focussed on creating and connecting these holistic core learning experiences (Jess, Dewar & Fraser, 2004; Jess, Haydn-Davis & Pickup, 2007; Jess & McIntyre, 2009; Keay, 2011) with a range of increasingly more complex and authentic PPE applications (Jess, 2012; Jess, Carse, MacMillan & Atencio, 2011; Jess, Atencio & Carse, 2012).

Aligned to these complexity-informed learning experiences, the pedagogy employed to support children's physical education learning[3] also needs to acknowledge the emerging relationships between the different ecological elements. We suggest, therefore, there is a need for teachers to develop a pedagogical repertoire that will help them, and their children, cope with and influence the many ecological interactions that take place. Consequently, we suggest there is a need for teachers to move towards a 'pedagogy of emergence' that acknowledges the self-organising, iterative and non-linear nature of children's learning, whilst also focussing on notions of predictability and unpredictability. To this end, we have increasingly worked with our students and teachers to include practices that recognise children's different starting points, focus on learning intentions that are less specific, long term and not 'quick fix' in nature, involve recursive elaboration to apply and transfer core learning over different applications and also signpost connections within, across and beyond physical education. More specifically, in line with Chow et al (2013), we have concentrated on supporting teachers' efforts to manipulate task and environment boundaries to create a mix of tasks focussed on consolidation, challenge and, when appropriate, disruption. As such, particularly in our more recent Basic Moves work with younger children, these tasks encourage children to learn through exploration, success and error (Jess, Atencio & Thorburn, 2011).

Therefore, we believe that this complexity-informed framework helps us view PPE in a new and exciting way because it offers the opportunity to explore and create learning

[3] From a learning perspective, we acknowledge children's physical education learning also takes place across and beyond the primary school curriculum in other subject areas, interdisciplinary projects, playtime activities, extra-curricular clubs and in experiences outside the school. However, for this paper the focus will specifically be on the curriculum and pedagogy experiences during scheduled PPE curriculum time.

experiences and pedagogical approaches that not only engage the children in the learning experiences but have the potential to prepare them for the unpredictable nature of the many learning applied contexts they will meet.

Individuals: The Children and Teachers

Before starting this section, we re-iterate two points. First, while children represent a key element of the PPE framework, they have been discussed earlier and will not be considered here. In addition, while the teachers' role in the framework could be considered in a number of ways, in line with the focus of the paper, we consider the teacher in terms of being a complex professional learner. As such, we take the view that teachers' PPE professional learning should be viewed as a complex endeavour and not predicated upon 'quick fix' solutions. We propose that future PPE professional learning needs to acknowledge teachers and groups of teachers, like their children and classes, are complex systems engaged in a complex learning process. In this vein, teachers should be supported to recognise that they are also learners who self-organise at different rates, organise their own learning in different ways and achieve different learning outcomes.

However, in their professional capacity, teachers are tasked with orchestrating the non-linear trajectories of children's learning by offering appropriate and differentiated learning tasks. This creates a significant challenge due to the longstanding difficulties relating to low levels of confidence and competence experienced by primary teachers when teaching physical education (HMIe, 2001; Morgan & Burke, 2004). Concomitantly, this situation is exacerbated by the traditional PPE professional development opportunities that are usually limited to short, off-site sessions focused on providing set knowledge, e.g. lesson plans and pre-set tasks (Elliott et al, 2011; Keay & Spence, 2012; Harris, Cale & Musson, 2011). Critically, these CPD opportunities usually ignore the previous experiences and needs of teachers, focussing on the products rather than processes of learning and, subsequently, do little to address their confidence and competence issues or the complex nature of PPE learning.

We propose, therefore, that PPE professional learning should support teachers, individually and collectively, to develop the capacity to self-organise their PE practices in ways that effectively support children's PPE learning. For this to happen, there needs to be a move towards professional learning experiences that are more emergent, situated, collaborative, connected and iterative. However, we recognise that this type of professional

learning will likely place many teachers on, or beyond, the edge of chaos (Morrison, 2003) because it requires them to move beyond pre-prepared plans from external sources towards the 'pedagogy of emergence' that heralds the active role they need to play in iteratively creating and re-creating learning experiences that support children's self-organising efforts over an extended period of time. As such, while traditional short courses will have a role to play in complex professional learning, we present four developments to help enhance the professional learning process for teachers.

First, because teachers are part of nested systems that seek to develop PE across the primary school years, we suggest they need to come together regularly to develop a shared vision, knowledge and skills that will bring some order and structure to children's PPE experiences. However, while shared knowledge and practice is more likely to help connect children's learning experiences across the primary years, teachers also need to recognise the evolving and unique contexts in which they work.

Second, teachers' PPE professional learning should not be seen as an isolated experience, but one that is connected to the immediate class, the school and nested environments. However, with PE often seen as an 'add-on' to the 'real' learning of the primary school (Pickup & Price, 2007), many primary teachers may not see the importance of integrating their PPE professional learning with the curriculum and pedagogical practices that take place within and beyond the classroom. As we discuss later, this change in mind-set is not only an important consideration for primary teachers but also for key stakeholders across the layers of the education system.

Third, as their PPE professional learning progresses, teachers need to recognise and negotiate the ever-changing immediate and nested boundaries that influence their personal thinking and practice around PPE. An important starting point for teachers is to recognise how their own prior experiences, current capacities and personal interests all act as boundaries to their professional learning efforts (Elliott et al, 2011; Lawson, 1983). We suggest that by regularly reflecting on the impact of these changing boundaries teachers will increasingly help teachers view the long term nature of PPE professional learning and not simply as a 'quick fix' solution.

Finally, as teachers move beyond the 'quick fix' PPE course approach, it is important they view PPE professional learning as an iterative and recursive process that begins during their initial teacher education and becomes part of a process that involves regularly revisiting,

elaborating and reflecting on their PPE learning experiences. This recursive approach will encourage teachers to learn through errors, consolidation and challenges and should mirror the complex learning experiences they offer their children. By focussing on their own professional learning in this way we suggest teachers will not only be able to more readily meet children's needs, but will also be able to identify professional learning tasks for themselves and their colleagues and, subsequently, provide evidence of their own professional learning (Keay & Lloyd, 2011). By understanding and recognising the complex ecological nature of their own professional learning teachers will more readily engage with a complexity orientation in their own pedagogy.

While we have found approaching PPE professional learning in this manner to be a complex endeavour in its own right (Atencio et al, 2012), we believe it is a key capacity building feature of the PPE framework. However, as we now discuss in the final section, we are conscious that a number of environmental elements also play a significant role in PPE developments.

The Environment: Physical Context & Key Stakeholders

Up to this point in our presentation of the PPE framework, we have concentrated on how complexity thinking offers a novel way to creatively engage with the nature of learning experiences, pedagogy and professional learning. However, as we note throughout the paper, other elements from the immediate and nested environment also interact to influence the way in which PPE develops and changes (Davis, Samura & Luce-Kempler, 2008). At the physical level, for example, numerous elements including weather, facilities and equipment all create different boundaries that will enable or restrict the nature of PPE offered in school settings. In particular, facilities, or the lack of them, have long been reported to limit the nature of PPE experiences (e.g. HMIe, 2001, Pickup & Price, 2007).

However, we suggest it is the various human stakeholders, including politicians, policy makers, national organisations, local authority officers, senior school managers, local sport coaches, parents and the general public, who impact on the nature of PPE developments both locally and nationally. Critically, the views these different stakeholders hold about PPE often differ and, aligned to the long-marginalised status of PPE, there is a distinct lack of clarity as to the purpose of the PPE in school settings. For example, within primary schools, PPE is often perceived to be different and inferior to other primary school subjects (Sparkes, Templin & Schempp, 1990), particularly English and Mathematics (Pickup & Price, 2007).

Consequently, school managers and parents often perceive PE as less important (Griggs, 2012) and consider it as a break from the 'real' work taking place in the classroom (Pickup & Price, 2007). It is therefore not common that strategies are in place to support and track children's and teachers' long term learning within PPE.

This lack of clarity is also witnessed in the way policy makers in different countries have engaged with PPE. For example, recent curriculum iterations in New Zealand (New Zealand Ministry of Education, 2007), Australia (Australian Curriculum, Assessment and Reporting Authority, 2012) and Scotland (Scottish Government, 2009) have all been heavily influenced by health agendas, whereas a more competitive sporting focus has consistently been evident in the English documentation (Department for Education, 2013). Crucially, as national guidance is developed from these policies, it is unsurprising that sporting and health-related agendas remain prevalent within the learning approaches adopted within primary schools, even although the past two decades have seen a growing literature emerging critiquing these sport and health agendas within PE (Penney & Chandler, 2000; Tinning & Glasby, 2002; Evans, 2013). As such, we are in agreement with Evans (2013), when we advocate the need to redress this balance and make efforts to move away from sport and health agendas to focus on learning and educational goals. Whilst we recognise that health and sport agendas cannot, and should not, be ignored, we strongly suggest that these should be negotiated in a considered and critical manner to ensure they are appropriately connected with the PE learning experiences offered to children (Penney & Jess, 2004).

However, while a move towards this type of PPE learning agenda may be a complex and long-term process of building knowledge and understanding and getting emotional 'buy-in' by the many stakeholders across the education system, we propose there is an urgent need for a 'shifting perspectives' agenda to be incorporated as a key feature of the PPE framework. In the first instance, we suggest that the key stakeholders from within the PE profession will need to take a lead role by working collectively to create and articulate a clear shared vision for the future of PPE: a vision we believe we have gone some way to articulate in this paper. From this starting point, we propose there is also a need to work across the different nested layers to create the capacity to shift perspectives on a larger scale (Fullan, 2004). As we have discussed earlier, it is our view that there is a need to provide the type of initial teacher education and professional learning that introduces, consolidates and extends teachers' knowledge, understanding and skills of a complex learning experiences, pedagogy and

professional learning in PPE. Concurrently, there is also a need for the PE profession to clearly articulate the purpose and complex nature of PPE to school management, local and regional authorities, national bodies, policy makers, parents and the wider general public. While this may be a daunting and time consuming endeavour, we suggest it is a key feature of the 'shifting perspectives' agenda.

Conclusion

This paper has set out to present a potential way forward for PPE that can build on the recent interest that has emerged in political, academic and professional arenas. By focussing on key principles from complexity thinking, we have tentatively presented a framework we believe offers all those involved in PPE the opportunity to engage creatively and productively with the complexities of PPE in the twenty first century. As such, this paper represents an open invitation to come together to explore and negotiate the possibilities for the future of PPE in our schools and communities.

References

Armour, K. (2012) (Ed), *Sports Pedagogy: An Introduction for Teaching and Coaching*, Prentice Hall

Atencio, M., Jess, M. & Dewar, K., (2012), 'It is a case of changing your thought processes, the way you actually teach': Implementing a Complex Professional Learning Agenda in Scottish Physical Education. *Physical Education & Sport Pedagogy,* 17/2, 127-144.

Australian Curriculum, Assessment and Reporting Authority, (2012), *The Shape of the Australian Curriculum,* ACARA, Sydney

Bransford, J., Brown, A., & Cocking, R. (2000). *How People Learn: Brain, Mind, and Experience & School*. Washington, DC: National Academy Press.

Bronfenbrenner, U., (1979), *The ecology of human development.* Cambridge. Harvard University Press*:* MA, United States.

Brown, S. & Eisenhard, K., (1997), The Art of continuous Change: linking complexity theory and time-paced evolution in relentlessly shifting organisations. *Administrative Science Quarterly,* 42, 1-34.

Byrne, D., (1998), *Complexity Theory and the Social Sciences* London: Routledge.

Campbell, T**. &** Jess, M**.** (2012), The Scottish Primary Physical Education Project: Beyond initial teacher education (Part 1), *Physical Education Matters* ,Winter

Carney, C. & Guthrie, J., (1999), Provision of Physical Education in Primary Education Initial Teacher Training Courses in Scotland. *European Journal of Physical Education,* 4, 124-135.

Chow, J. Y., Renshaw, I., Button, C., Davids, K., & Tan, C. W. K. (2013). Effective Learning Design for the Individual: A Nonlinear Pedagogical Approach in Physical Education. In A. Ovens, T. Hopper & J. Butler (Eds.). *Complexity thinking in physical education: Reframing curriculum, pedagogy and research*. London: Routledge

Cilliers, P., (1998), *Complexity and Postmodernism*. Routledge: London.

Cilliers, P. (2010) *Foreward,in* Osberg, D. & Biesta, G., (Eds.), *Complexity Theory and the Politics of Education*. Sense Publishers: Amsterdam.

Davids, D., Hristovski, R., Araujo, D., Balague Serre, N., & Button, C (2013) *Complex Sytems in Sport,* Abingdon, Routledge

Davis, B. & Sumara, D., (2001), Learning communities: Understanding the workplace as a complex system. *New directions for adult and continuing education,* 92, 85-95.

Davis, B. & Sumara, D., (2006), *Complexity and education: inquiries into learning, teaching, and research.* Lawrence Erlbaum Associates Publishers: London, UK.

Davis, B. & Sumara, D., (2010), Enabling constraints: Using Complexity Research to Structure Collective Learning. In Butler, J. & Griffin, L. (Eds.), *More teaching Games for Understanding: Moving Globally*. Human Kinetics, Champaign, Ill.

Davis, B., Sumara, D., & Luce-Kapler, R. (2008). Engaging minds: changing teaching in complex times, second edition. New York: Routledge

Department For Education (2013), *The National Curriculum: Framework Document***,** Department for Education, London

Elliot, D., Atencio, M., Jess, M. & Campbell, T., (2011), From PE experiences to PE teaching practices? Insights from Scottish primary teachers' experiences of PE, teacher education and professional development. S*port, Education and Society*

Evans, J., (2013) Physical Education as porn!, *Physical Education and Sport Pedagogy*, 18/1, pp.75-89

Fullan, M., (2004), *Change Knowledge*. Microsoft

Gare, A.,(2000), Systems theory and complexity, *Democracy and Nature,* 6, 327-339

Gibson, J. J. (1979), *The ecological approach to visual perception*. Houghton Mifflin: Boston.

Griggs, G. (2012) *An Introduction to Primary Physical Education*, Abingdon, Routledge.

Griggs, G**.** & Ward, G. (2012) Physical Education in the UK: Disconnections and Reconnections, *Curriculum Journal.*

Harris, J., Cale, L., & Musson, H. (2011). The effects of a professional development programme on primary school teachers' perceptions of physical education. Professional Development in Education, 37/2: 291-305.

Haywood, K. & Getchell, N., (2009) *Life Span Motor development*, (5th Edition), Human

HMIe, (2001), *Improving Physical Education in Primary* Schools. HMIe, Edinburgh.

Hopper, T. & Sandford, K., (2010), Occasioning moments in the Games-as-Teacher Concept: Complexity Thinking Applied to TGfU and Video Gaming. In Butler, J. & Griffin, L., (Eds.), *More teaching Games for Understanding: Moving Globally*. Champaign, Ill., Human Kinetics.

Hunter L (2006) Research into elementary physical education programs. In Kirk D, Macdonald D and O'Sullivan M (eds.) Handbook of Physical Education. London: Sage Publications, pp. 580–595.

Jess, M., (2012), The Future of Primary PE: A 3-14 Developmental and Connected Curriculum. In Griggs, G. (Ed.), *An Introduction to Primary Physical Education*. Routledge: London.

Jess, M., Atencio, M. & Carse, N. (2012), Introducing Conditions of Complexity in the Context of Scottish Physical Education. In Ovens, A., Hopper, T. & Butler, J. (Eds.) *Complexity Thinking in Physical Education: Reframing Curriculum, Pedagogy and Research.* Routledge: London.

Jess, M., Atencio, M. & Thorburn, M., (2011), Complexity Theory: Supporting Curriculum and Pedagogy Developments in Scottish Physical Education. *Sport Education and Society,* 16/1, 179-199.

Jess, M., Carse, N., MacMillan, P. & Atencio, M., (2011), Sport Education in Scottish Primary school: Emergence of an Authentic Application, in Hastie, P. (Ed), *Sport Education: International Perspectives;* London, Routledge

Jess, M. & Collins, D., (2003), Primary Physical Education in Scotland: the future in the making. *Physical Education & Sport Pedagogy*, 8, 103-118.

Jess, M., Dewar, K. & Fraser, G., (2004), Basic Moves: Developing a Foundation for Lifelong Physical Activity*, British Journal of Teaching in Physical Education*, 35/2, pp. 23-27.

Jess, M., Haydn-Davies, D. & Pickup, I., (2007), Physical Education in the Primary School: A Developmental, Inclusive and Connected Future, *Physical Education Matters, 2/1*.

Jess, M., & McEvilly, N., (2013): Traditional and contemporary approaches to career-long professional learning: a primary physical education journey in Scotland, *Education 3-13: International Journal of Primary, Elementary and Early Years Education*

Jess, M., & McIntyre, J., (2009), Developmentally Appropriate Physical Education in the Early Years*, Nursery World*, Vol. 28th January 2009.

Keay, J. (2011) *Supporting Key Stage 1 Physical Education*, Reports for Top Foundation: Youth Sport Trust, Loughborough

Keay, J., *&* Lloyd, C., *(*2011*) Linking Children's Learning with Professional Learning: Impact, evidence and inclusive practice,* Rotterdam, Sense.

Keay, J. & Spence, J (2012) *Professional Development in Primary Physical Education* in Griggs, G. (2012) *An Introduction to Primary Physical Education*, Abingdon, Routledge.

Keeton, M.T., Sheckley, B.G., & Griggs, J.K. 2002. Efficiency and effectiveness in higher education. Dubuque, Iowa: Kendall/Hunt Publishing Company.

Kirk D (2005) Physical education, youth sport and lifelong participation: The importance of early learning experiences. European Physical Education Review 11/3: 239–255.

Kirk, D., (2010), *Physical Education Futures.* Routledge: London.

Locke L & Graber K (2008) Elementary school physical education: Expectations and possibilities. Elementary School Journal 108/3: 265–273.

Lawson, H. (1983) Toward a model of teacher socialization in physical education: entry into schools, teachers' role orientations, and longevity in teaching, *Journal of Teaching in Physical Education*, 3/1, 3-15.

Marton, F., Hounsell, D. & Entwistle, N., (eds.) (2005), The Experience of Learning: Implications for teaching and studying in higher education. 3rd (Internet) edition. Edinburgh: University of Edinburgh, Centre for Teaching, Learning and Assessment

Mason, M., (2008), What is complexity theory and what are its implications for educational change? *Education Philosophy and Theory*, 40/135-49.

Morgan, P. & Bourke, S., (2004), "I know it's important but I'd rather teach something else!" An investigation into generalist teachers' perceptions of physical education in the primary school curriculum. Paper presented at the *Australian Association for Research in Education Annual Conference*, Melbourne, Victoria.

Morrison, K., (2003), Complexity theory and curriculum reforms in Hong Kong. *Pedagogy, Culture and Society*, 11/2, 279-302.

New Zealand Ministry of Education (2007) *Health and Physical Education in the New Zealand Curriculum*. Wellington: Learning Media.

Newell, K., (1986), Constraints on the development of coordination. In Wade, M. & Whiting, H.T.A., (Eds.), *Motor development in children: aspects of coordination and control*, 295-317. Elsevier Science*:* Amsterdam.

O'Sullivan, M. (2012), New directions, new questions: relationships between curriculum, pedagogy, and assessment in physical education, *Sport, Education and Society, 18/1,1-5,*

Osberg, D., Doll, W. & Trueit, (2009), Editorial: Limiting Complexity. *Complicity: An International Journal of Complexity & Education,* 6/2, iii-x.

Olsen, M., (2008), Foucault as Complexity Theorist: Overcoming the problems of classical philosophical analysis. *Educational Philosophy and Theory*, 40/1, 96-117.

Ovens, A., Hopper, T., & Butler, J., (2012), *Complexity Thinking in Physical Education: Reframing Curriculum, Pedagogy and Research,* London, Routledge

Penney, D. (2008) Playing a political game and playing for position: Policy and curriculum development in health and physical education, *European Physical Education Review,* 14/1, 33-49.

Penney, D. & Chandler, T., (2000), Physical education: what futures? *Sport, Education & Society*, 5/1, 71-87.

Penney, D.; Brooker, R.; Hay, P. & Gillespie, L. (2009), Curriculum, pedagogy and assessment: three message systems of schooling and dimensions of quality physical education, *Sport, Education and Society,* 14/4, 421-442

Penney, D. & Jess, M., (2004), Physical Education and Physically Active Lives: A lifelong approach to curriculum development. *Sport, Education and Society*, 9/2, 269-287.

Petrie, K. & lisahunter. (2011). Primary teachers, policy, and physical education. *European Physical Education Review*, 17(3), 325-339.

Pickup, I. & Price, L., (2007), *Teaching physical education in the primary school. A developmental approach*. Continuum: London.

Pinder, Ross A., Renshaw, Ian, & Davids, Keith (2009) Information–movement coupling in developing cricketers under changing ecological practice constraints. *Human Movement Science*, *28/*4, 468-479.

Prigogine, I., (1976), Order through Fluctuations: Self Organization and Social System. In Jantsch, E. & Waddington, C., (Eds.), *Evolution and Consciousness: Human Systems in Transition*. Addison-Wesley: Reading, MA.

Quay J and Peters J (2008) Skills, strategies, sport, and social responsibility: Reconnecting physical education. Journal of Curriculum Studies 40(5): 601–626.

Rogoff, B., & Lave, J. (1984). (Eds.). *Everyday cognition: Its development in social context.* Cambridge, MA: Harvard University Press

Rovengo, I. (2006), Situated perspectives on learning. In Kirk, D., Macdonald, D. & O'Sullivan, M., (Eds.), *The Handbook of physical education* 262-274. Sage: London.

Scottish Executive, (2004), *The Report of the Review Group on Physical Education.* HMSO: Edinburgh.

Scottish Government, (2009), Curriculum for Excellence: experiences and outcomes, online at http://www.ltscotland.org.uk/curriculumforexcellence/experiencesandoutcomes/index.asp (accessed 2 June 2011).

Sparkes, A., T. Templin, and P. Schempp. 1990. The problematic nature of a career in a marginal subject: Some implications for teacher education. Journal of Education for Teaching 16/1: 3–28.

Stokols, D. (1992), Establishing and maintaining healthy environments: toward a social ecology of health promotion. *American Psychologist* 47:6–22

Tinning, R. & Glasby, T., (2002), Pedagogical Work and the 'Cult of the Body'. Considering the role of HPE in the Context of the 'New Public Health', in *Sport, Education and Society*, 7/7.

Tinning, R., & Rossi, A. (2013). Thinking about complexity thinking for physical education. In Ovens, A., Hopper, T & Butler, J. (Ed.), *Complexity thinking in physical education: reframing curriculum, pedagogy and research* Abingdon,: Routledge.

Tsangaridou N (2012) Sport education in the elementary school: A report from Cyprus. In Hastie P (ed) Sport Education: International Perspectives. New York: Routledge Publications, pp.75–91.

Wallian, N., & Chang, C. (2012), The 'Complexity Thinking' paradigm in PE teacher education: perspectives about the 'reflective practitioner' concept in France.. In Ovens, A., Hopper, T & Butler, J. (Ed.), *Complexity thinking in physical education: reframing curriculum, pedagogy and research* Abingdon,: Routledge.

Warburton, P., (1989), Barriers to Progress Primary School Physical Education. *British Journal of Physical Education,* 20/4, 165-166.

Welk, G., (1999), The Youth Physical Activity Promotion Model: A conceptual bridge between theory and practice. *Quest,* 51, 5-23.